Applied Statistics Minor
Stephen F. Austin State University

Required Courses (18 hours): MTH 144 or MTH 233, MTH 220, STA 320, STA 321, STA 322, & STA 327.

MTH 144 or MTH 233: Business Calculus or Calculus I
An exposure to and a basic understanding of both differential calculus and integral calculus is essential for properly understanding why various principles in probability and statistics work.

MTH 220: An Introduction to Probability & Statistics
A first course. Introduction to basic probability calculations & fundamental statistical ideas. The language of experiments and randomness as well as the ideas of random variables and distributions are first presented. Statistical ideas include graphical and numerical summary of data, sampling distributions, point and interval estimation & the philosophy of hypothesis testing.

STA 320: Statistical Methods
An introduction to analysis of variance, categorical data analysis, and experimental design. First principles of regression. Elements of dependent data (time series data) and quality control. This course is about providing the student with a wide array of statistical techniques for the analysis of many types of data. Can be taken right after 220.

STA 321: Applied Nonparametric Statistics
Nonparametric statistics is concerned with statistical methods where no distributional assumptions are made about the data collected. The techniques learned in this course are parallel and competitive to those learned in 220 and 320. Many of the same data structures are analyzed, just with different assumptions. Thus, the student is equipped with a varying degree of techniques for data analysis based on what can be reasonably assumed about the experiment and/or the data. Can be taken right after 220.

STA 322: Statistical Modeling (Regression)
Regression is concerned with modeling the relationships between two or more variables with one aim being prediction. Regression analysis looks at relating a response variable to a set of predictor variables. Regression is a large and extremely useful branch of statistics and is central to statistical applications in virtually every area of business, science & education. To be taken after calculus, 220 and 320.

STA 327: Experimental Design and Analysis
This course focuses on how statistical experiments can be designed to elicit the proper type of data to answer particular questions that the experimenter has in mind. Then, after the proper experiment is designed, we study appropriate statistical methods to be used in each experimental case. To be taken after 220 and 320.
WHAT IS STATISTICS?

"I like to think of statistics as the science of learning from data...It presents exciting opportunities for those who work as professional statisticians. Statistics is essential for the proper running of government, central to decision making in industry, and a core component of modern educational curricula at all levels."

Jon Kettenring
ASA President, 1997

American Heritage Dictionary® defines statistics as: "The mathematics of the collection, organization, and interpretation of numerical data, especially the analysis of population characteristics by inference from sampling."

The steps of statistical analysis involve collecting information, evaluating it, and drawing conclusions. The information might be:

- A test group's favorite amount of sweetness in a blend of fruit juices
- The number of men and women hired by a city government
- The velocity of a burning gas on the sun's surface

Statisticians provide crucial guidance in determining what information is reliable and which predictions can be trusted. They often help search for clues to the solution of a scientific mystery, and sometimes keep investigators from being misled by false impressions.

Statisticians work in a variety of fields, including medicine, government, education, agriculture, business, and law.

WHAT DO STATISTICIANS DO?

Statisticians help determine the sampling and data collection methods, monitor the execution of the study and the processing of data, and advise on the strengths and limitations of the results. They must understand the nature of uncertainties and be able to draw conclusions in the context of particular statistical applications.

Surveys: Survey statisticians collect information from a carefully specified sample and extend the results to an entire population. Sample surveys might be used to:

- Determine which political candidate is more popular
- Discover what foods teenagers prefer for breakfast
- Estimate the number of children living in a given school district

Government Operations: Government statisticians conduct experiments to aid in the development of public policy and social programs. Such experiments include:

- Consumer prices
- Fluctuations in the economy
- Employment patterns
- Population trends

Scientific Research: Statistical sciences are used to enhance the validity of inferences in:

- Radiocarbon dating to estimate the risk of earthquakes
- Clinical trials to investigate the effectiveness of new treatments
- Field experiments to evaluate irrigation methods
- Measurements of water quality
- Psychological tests to study how we reach the everyday decisions in our lives

Business And Industry: Statisticians quantify unknowns in order to optimize resources. They:

- Predict the demand for products and services
- Check the quality of items manufactured in a facility
- Manage investment portfolios
- Forecast how much risk activities entail, and calculate fair and competitive insurance rates